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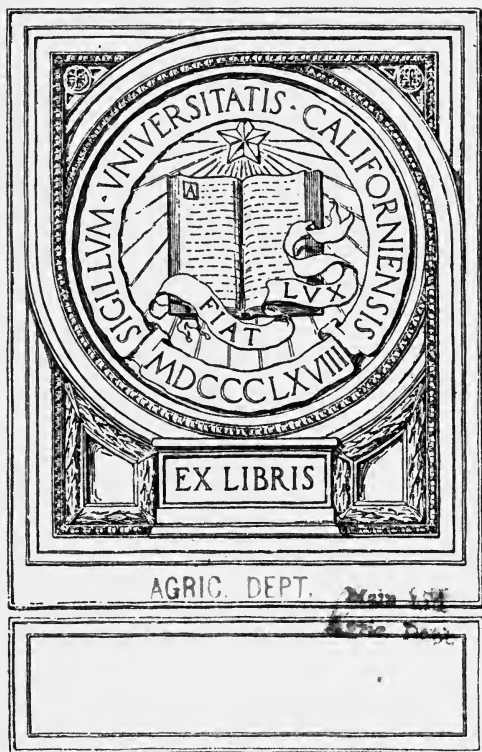
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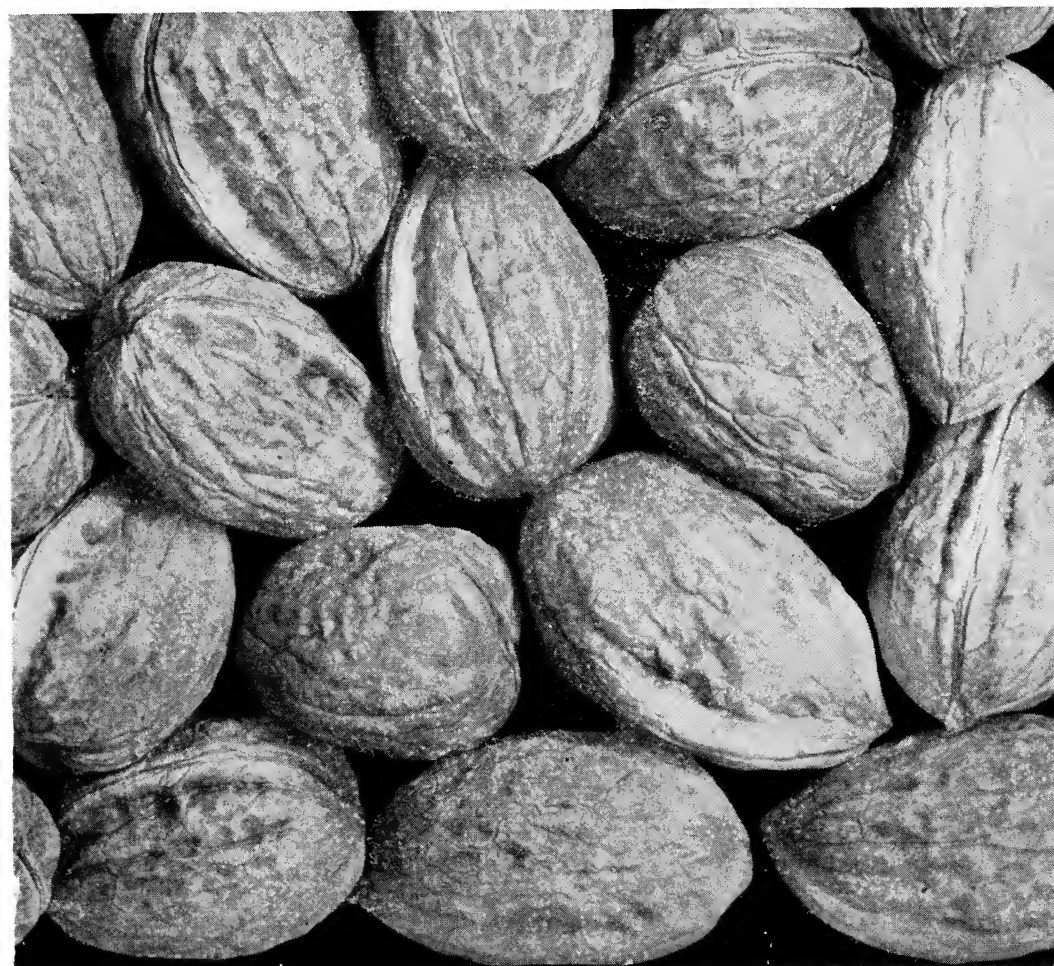
WALNUT CULTURE
IN WESTERN AND SOUTHERN OREGON

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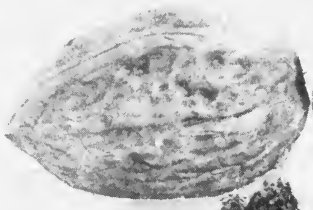
OREGON WALNUTS



SOUTHERN PACIFIC

OF THE
COLLEGE OF
AGRICULTURE

WALNUT CULTURE *in Western and Southern* OREGON



OREGON WALNUT ORCHARD



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Oregon Walnuts



THIS book is compiled for the purpose of giving accurate information on Walnut Culture in Western Oregon.

¶ To the prospective walnut grower, it will be found valuable in locating and establishing the orchard and in selecting varieties of trees.

¶ To the present owner of a walnut orchard it will be found valuable for the technical analysis of grafting, pruning, cultivating the orchard and harvesting the crop.

Walnut Culture in Western and Southern Oregon

The culture of English walnuts is increasing to such an extent it bids fair to become one of the principal horticultural activities of the state. Walnuts have been grown in the state now for about twenty-five years, there being one commercial orchard of fifteen acres, twenty-one years old, and numerous scattered trees throughout the state of about the same age. The industry, however, during these twenty-five years has had rather a checkered career. Many of the early trees were of types that were not suited to our climatic conditions. Many trees of the California soft shell, or Santa Barbara, type were planted. Nuts were often bought at grocery stores and planted by interested parties. While many of these trees grew, relatively few of them ever bore commercial crops of fruit, at least not regularly.

About ten years ago, walnut planting assumed almost boom proportions and, consequently, many of the trees planted were



Rolling land best for walnut growing.



Walnut trees in their prime.

of the tender, inferior grades, and the winter of nineteen eight fortunately destroyed a large percentage of such trees. With the introduction of superior French strains, the industry became firmly established, until now we have thousands of acres just coming into bearing, producing nuts that are selling as high as thirty-five cents per pound. A list of some of the larger plantings is given in the back of this bulletin.

The present consumption of the English walnut in the United States is only about 50,000,000 pounds—this being only about one-half pound for each person in our great country. Of these nuts, 22,026,524 pounds are raised in the United States and during the past few years an average of about 30,000,000 pounds has been imported. Of these 22,026,524 pounds that are produced in this country, California is producing 21,432,266 pounds, Mississippi 66,492 pounds, Oregon 79,060 pounds, and all other states 448,706 pounds. There are at present in the United States 914,270 bearing English walnut trees, while 806,413 are still too young to bear. This is according to the United States census of 1910. While Oregon has a very small percentage of bearing walnut trees, it has, nevertheless, about one-fourth of the young trees of the entire United States that have not reached bearing age.

The most encouraging fact concerning English walnuts is

that the consumption of this food product in the United States during the past ten years has practically doubled. Ten years ago we were raising somewhat over 10,000,000 pounds—the last census gives us 22,026,524 pounds. In 1902 we were importing over 12,000,000 pounds, while in 1912 we were importing from 26,000,000 to 37,000,000 pounds. It has been said by some that we will have less and less foreign competition. I hardly know upon what facts such statements are based, since the imports have increased, if anything, faster than the home production. It would not be safe for walnut men to feel that they have no competition. The pecan, filbert and almond all enter into some competition against the English walnut. However, it should be a very easy matter to encourage the American people to use more nuts in their diet. In fact, they are already doing that without any special effort on our part.

The present outlook for the expansion of the industry is very promising. Undoubtedly the American public will consume many times the present output and very little concern need be given by the present producer for the marketing of this product. In a few years, however, this subject will need special attention.

Choosing the Orchard.

Location: The climate of western and southern Oregon is ideal for the production of the English walnut. It more nearly approximates the climate of Europe and Asia, where these nuts are produced abundantly, than any other section of the United States. In other words we have very few extremes of temperature as regards either heat or cold. The moisture supply is generally ample. Where the improved French strains are



Protecting the grafts in paper bags until the scions sprout.



A well developed walnut tree.

planted, very little damage will result from frost. In choosing the orchard, however, one should bear in mind that good air drainage is essential and that if the trees are planted in frost pockets there will be damage during certain years, despite the fact that the French strains bloom so late. In some of the mountain sections, there is a possibility that the extreme rains, both in the spring and fall, might have an influence on the yields. The walnut should not be planted where there are extremes of heat in summer. This tends to cause a burning of the nuts and will often result in a poorly filled nut.

Soil: The walnut is a deep rooted, heavy feeding plant and should, therefore, be planted in deep, rich, moisture-retaining soils. There are many types of soil found in western and southern Oregon, and undoubtedly we will find as time goes on that certain soils that have heretofore been held as not suitable for walnut culture will be found to be producing commercial crops. The red hills and river bottoms, at the present time, are the principal producers of this crop, and where these soils are deep,

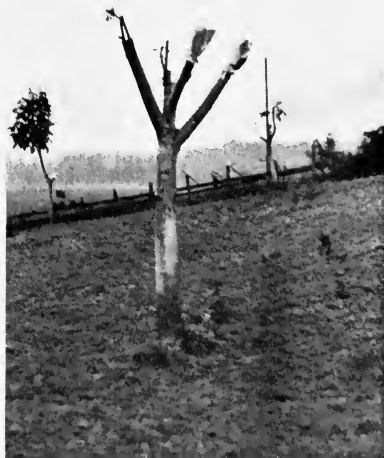
the trees are making magnificent growth. While few walnuts are grown as yet on the heavier clays, there is a possibility that if the American Black nut is used, for a root, there will be a possibility of producing heavy commercial crops.

The surface soil should be friable and easily tilled, and one which can be formed easily into a good heavy dust mulch for retaining moisture. The sub-soils should be of such a nature that roots can penetrate and get plenty of food and moisture. Avoid rock, coarse gravel soils and extremely heavy clays. The deeper the soil is, the better. It is a waste of money to plant walnuts on soils which are only from two to four feet in depth. While young trees will thrive on such soils, you cannot hope to produce large, healthy, heavy producing trees under such conditions.

Soil drainage is a question that should be looked into very carefully, as the average root used will not stand an excess of moisture. The gently rolling locations are always preferable to flat areas, as the former are more apt to give good soil and air drainage.



The scions have
sprouted well.



Bags removed, showing
sprouted scions.



Franquette Walnuts

Propagation.

Sprouting of Seed: There are several methods used in preparing the seed for sprouting. Some growers have practiced planting in the fall in the open ground in the nursery.

There are several

difficulties in this method. One is that the nuts do not often germinate over-well. In fact, some of the types of black walnuts may remain in the ground two years before they germinate, and there is some danger of decay. However, where it is desired to grow seedling English walnut trees, it is the common practice of our nurseries to plant the nuts in open ground in the nursery row in the fall.

Another danger to be watched out for is that of squirrels. If given the opportunity, they may purloin the entire patch.

Other growers have practiced stratifying the seed in boxes in sand. When this is done the nuts are often stratified in the fall. Care must be taken, however, that the sand does not become too wet, for if it does, the nuts will mold, and there is danger of decay. On the other hand, if the sand is allowed to become too dry, the nuts will not germinate. One of the most satisfactory methods is to wait until late winter, or early spring, say in February. Choose the warm, sunny side of some building. Lay down a few 2x4's and upon these put boards. Spread on the boards a few inches of moist sand—then spread the nuts on this moist sand and cover them with additional sand. If sufficient sandy soil is not to be



Bagging of trees in nursery as soon as they are grafted.



Walnut trees, eight years of age.

had, the nuts can be covered with wet burlap or blankets. Care should be taken that if extremely heavy rains come, some boards are laid over the bed to shed the water and keep the soil from washing away. The success of germination by this method has been phenomenal in many cases, especially where California Black seed has been used.

In the early spring these nuts will germinate and send out good vigorous sprouts. Before transplanting in the open sand one should choose good rich ground for the nursery. This should be plowed and harrowed very thoroughly, so that it contains no lumps. The ground should then be furrowed and the young sprout walnuts carefully transplanted in rows. Care should be taken in drawing the dirt up around the transplant



Low method of heading trees and good system of staking.

not to break the sprout. One needs to be very careful during the first few cultivations not to injure the young shoots, as they are about as tender as asparagus shoots, and if the ground is lumpy there is danger of the lumps being thrown up against them and injuring the shoots,



One of Oregon's largest walnut orchards.

thus making them worthless. If the ground is rich and well prepared, the young trees will soon start into vigorous growth, and they should be given the best of tillage and hand hoeing, so as to keep them growing. It will be advisable, in many cases, to stake the young trees to keep them from becoming injured.

If the trees are given good care, the large majority of them should make sufficient growth in one season so that they can be successfully grafted the following spring.

In grafting English walnuts, it is imperative that one choose good scion wood. This can generally be found on all trees producing vigorous one-year-old wood. Some of the two-year-old wood will suffice. The tip growth is undesirable, as it is too soft and spongy. The wood which makes the best scion should not contain over one-half its diameter of pith. Scion stocks can be cut a foot or more in length. These can be stratified in moist sand or, preferably, can be put in cold storage plants, where they are stored on ice. They can be kept there at least until needed. In fact, scions in this way could be kept for some of the very late English walnut trees which do not come into activity until June. Care must be exercised to keep the buds absolutely dormant, as a sprouted scion is worthless.

Grafting the Walnut Trees: There are many large black walnut trees scattered over the state which should be top-worked to the better strains of English walnuts. In four years these trees could be made to be extremely productive.

Walnut grafting is exceedingly difficult and I would suggest that if you have very much grafting to do, either in the nursery rows, or in top-working of trees, you either work with someone who is considered an expert in this class of work, or employ someone who has demonstrated that he can do the work successfully. The most successful work in this state has been done by Mr. George G. Payne, of Campbell, California. The methods used, however, are outlined in the following description, taken from directions given by him:

"For scions select round wood with buds not too far apart. Use upright or horizontal wood and never dropping wood. Avoid terminal buds. Spurs on young trees a foot or less in length make good wood.

"When possible, leave scion wood on trees until two or three weeks before they show signs of starting, which would be about April first to tenth. Cut in lengths from twelve to fourteen inches and stratify carefully in sand.

"Before grafting, wait until buds on stock show signs of bursting. If placed in position before the sap starts they may dry out. One can start in earlier on English walnuts than on Blacks, but Blacks will permit a longer grafting season.

"Bright, extra sharp tools are necessary. Good knives are the IXL, the Henckel, budding knife, large size; Joseph Rogers' iron-handled grafting knife; and a shoemaker's knife is very desirable. For a splitting knife use Rogers' butcher knives. A splitting maul like an old-fashioned potato masher is good, dimensions 11x4 $\frac{1}{2}$ x3. Hickory or hardwood wedges,

six inches in length, of different widths, are desirable for splitting. Have the edges a little thinner than the center. Have a sharp saw. Use oil stones, emeries, etc., to keep tools always sharp.

"Never make a concave cut on scion. Choose a piece of wood having two eyes of straight growth. Cut off 2 $\frac{1}{2}$ inches below bud, with slanting cut. Turn lower bud upward. Begin with knife on opposite or a little lower than bud. Cut just through the bark to wood. Continue downward, very gradually cutting deeper, until two-thirds of cut is completed. The remaining one-



A system of heading back which should be avoided. Instead of two, should have at least four scaffold limbs.



A well handled orchard.

third is cut considerably more abrupt. Turn the scion over and treat the other side the same. Have scion a little thicker on the outside. After scion is cut, prepare stock. Saw off straight, then take butcher's knife and split very lightly through center, then bear heavily on handle of knife and split the opposite side of stock. Now drive in wedge. One must now carefully fit stock to scion. It is generally necessary to cut out a little wood on each side of split in such a way that when wedge is released the scion is caught firmly and perfectly. The scion should be inserted as with other grafts, so as to bring growing layers together. Next, stuff newspaper down in the chink between the two scions. Now wax. Cover entire cut surface. It is fatal to leave it exposed. It is sometimes necessary to rewax three or four times. If scion buds are slightly covered with wax it will do no harm. After waxing, tie an inflated paper bag over graft, leaving an inch or two for scions to grow.

Nursery Grafting.

“The work is done at the same season as top-working. When possible, avoid doing the grafting in the early morning hours, or following a heavy rain, for at such times considerable bleeding may take place.

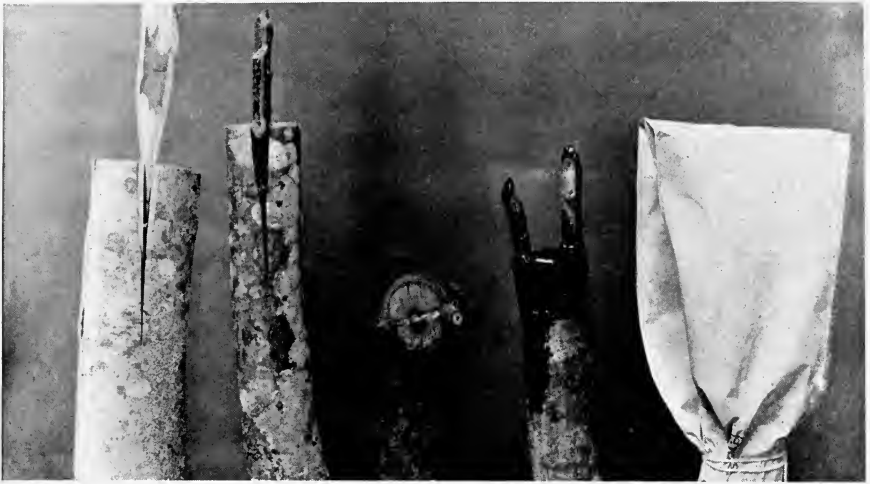


Young walnut orchard with cherry fillers.

“Pick away the dirt from around the tree. With a sharp band shear, cut off the tree about two inches above the ground. In making the cut always have the blade down. Then with a shoemaker’s knife make a vertical cut from an inch to an inch and one-half in length, the cut terminating at the stub of the stock. The cut is very shallow at the lower end and ends deeply at the center. Now make a cut at right angles to the first. The result will be that you will take out a right-angled piece from the stock, the cut being broad and deep at the top and shallow and drawn to a point at the lower end.

“A scion is so cut as to fit this right-angled notch in the stock very closely. First cut the scion off sharply, then make a cut at right angles to this, which will be from an inch to an inch and one-half in length. Draw it in slightly toward the point. If the scion and stock do not fit absolutely smooth, make new cuts until you get a true, smooth connection. Now take some coarse twine or yarn and wrap the two together securely, finally tying with a half hitch. This being done, wax over very carefully, probably at least two or three times, as per directions given for cleft grafting. Use paper bags and treat as in previous method.”

Mr. Fred Groner of Hillsboro, Oregon, who has done a



Top-working the American Black to the English

great deal of successful walnut grafting, states that he is able to get a larger percentage where the nursery trees for grafting are cut off at the point where the wood begins to get soft. He has also found that a beveled knife is superior for the work. However, since the mushroom root rot is making its appearance, it may be better to follow some of the California methods and graft the trees well above the surface of the ground. We would also caution the walnut grafters to cut their scions so that there is a long surface of contact.

The grafting wax that is being used very successfully is the following:

Resin, 5 pounds; finely pulverized charcoal, $\frac{1}{2}$ pound; beeswax, 1 pound; raw linseed oil, 1 gill.

After melting the beeswax and resin over a fire that is not too hot, add the charcoal, stirring steadily, then add the oil. After moulding the bricks, it should be placed in greased pans. As one needs to use the wax it may be broken off in lumps and melted in suitable dishes. It should be in liquid form when applied.

Establishing the Orchard.

In establishing the walnut orchard, the first point to study carefully is the choosing of the trees. There are two types of



Walnut tree with a nice spread but headed a foot too high

men who have tried the grafted trees, who are in favor of discarding them and taking up the seedlings, while a great many men now growing both grafted and seedlings say that if they were planting again they certainly would plant grafted types exclusively.

The statement is often made that the seedling orchards are worthless. This statement is altogether too strong. There is no question, in my mind, that some of the seedling orchards that have the right type of seedlings will prove to be very attractive investments, while, on the other hand, the proper type of grafted trees is without doubt the best investment to make.

The advantages of the grafted tree are that you will have a more uniform orchard, the trees will come into bearing younger, and the product is very much more uniform than can be expected from the seedling orchards. Many of the seedling trees bloom or come to foliage too late to procure good crops. Others bloom so early that they are invariably injured by the frost. Walnuts will bloom over a period extending from early



Low headed type of Walnut Tree. Very satisfactory if tied well.

trees being planted in the Northwest at the present time—namely, the seedling and the grafted trees. The grafted trees are gaining in popularity very rapidly. It is hard to find men who have tried both seedling and grafted trees, who do not favor the grafted ones. I have found only a few

April until the middle of July. The very early trees are generally caught by frost, and it is doubtful if trees that come out as late as June 15 will mature their crop. Trees coming out from the first to the middle of May are very desirable. Some trees are too weak physically and are valueless.



Young walnut orchard with prune fillers and garden truck.

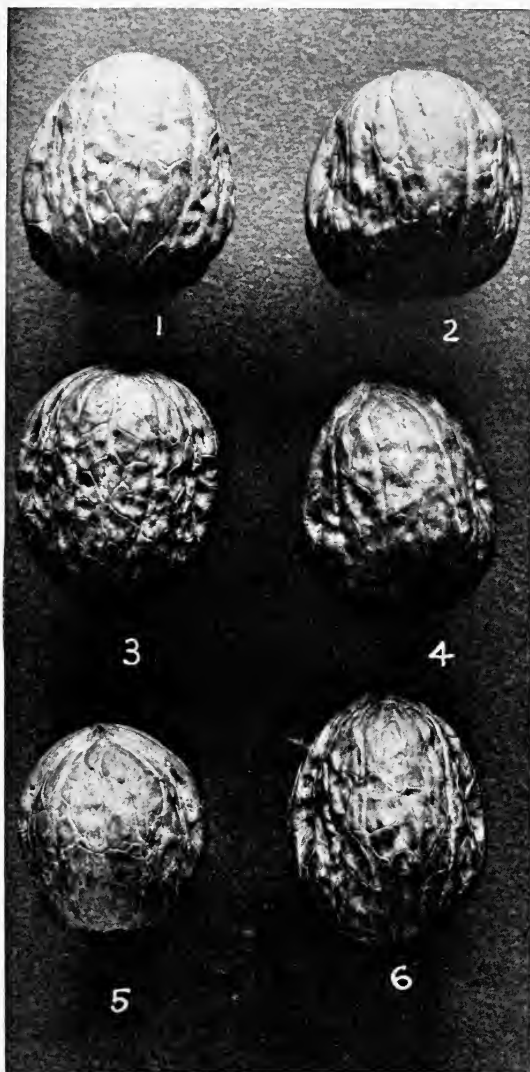
It must not be assumed that there is no fluctuation in grafted trees, as grafted walnut orchards will probably vary to about the same extent that the apple, pear, plum or orange will vary. On the other hand, there are many seedling orchards that will not produce over sixty per cent of good trees.

Many of the planters of walnuts five or six years ago attempted to purchase grafted trees in large numbers, but found it impossible to do so. The trees were not for sale at any price. Again, some of the early grafted trees were very disappointing. They were imported French trees that had been grown in cold frames and flower pots and were stunted, inferior trees. The introduction of such stock did very much to prejudice some of our early planters against the grafted trees.

As regards whether to plant seedlings or grafted trees, very careful judgment must be used. Where seedling trees are planted, the nut should be chosen from an isolated tree or an orchard where one variety is grown. If nuts are chosen from mixed orchards, where cross pollination has taken place, one must



A Well Headed Walnut Tree



Varieties of Oregon grown walnuts.

- | | |
|----------------|----------------|
| (1) Mayette | (2) Meylan |
| (3) Parisienne | (4) Parry |
| (5) Chaberto | (6) Franquette |

expect variation, for, as the old saying is, "Blood will tell." The more crosses you have, the more variations one must naturally expect. In former days, much was said concerning the generation of trees. The first generation consisted of trees from nuts which were taken from the selected trees. The second generation were the trees which resulted from these nuts. It was formerly believed by some people that, owing to climatic and soil conditions of our state, these second generation trees would produce nuts superior to the mother trees, and superior to any trees which would follow from mixed pollination. The walnut, however, follows the same general rules as do other plants; namely, that when you have seed-

lings, you may be fortunate enough to secure a few superior to either parent in some respects, but a large majority of the nuts will be inferior to either parent. It is only by selecting these isolated seeds that have not been cross pollinated, from a

hardy French strain, such as the Franquette, that one can expect to secure good seedling stock.

Where grafted trees are preferred, one should certainly know something about the pedigree of the trees, for unless the roots are vigorous and the scions selected from trees of known value, the grafted trees will probably be worthless.

Some men are combining seedling and grafted orchards in this way. Seedling orchards are first planted and then the percentage which are inferior are grafted over to selected scions. Many of these trees in this way can be made to become very productive trees, but with others the vitality is so poor that it does not pay to attempt to

do much with them. Eventually we are going to find out what are the four or five best varieties or strains for this section of the country, and as soon as that is determined, a large majority of our trees will be grafted to these best strains.

There are three types of stock being used in the Northwest



Nuts at top and bottom are result of seedlings from grafting of pointed Franquette and Round Mayette in center.

at the present time—the Northern California Black, the American Black, and the English. There are many other types that possibly have been used in a limited way, such as the Southern California Black and various hybrids. Undoubtedly, we are going to use more than one stock as time goes on, but at present the Northern California Black stock is the favorite and most of the orchards where this stock has been used produce vigorous young trees. It will take many years to demonstrate the best stock to use under our varied conditions.

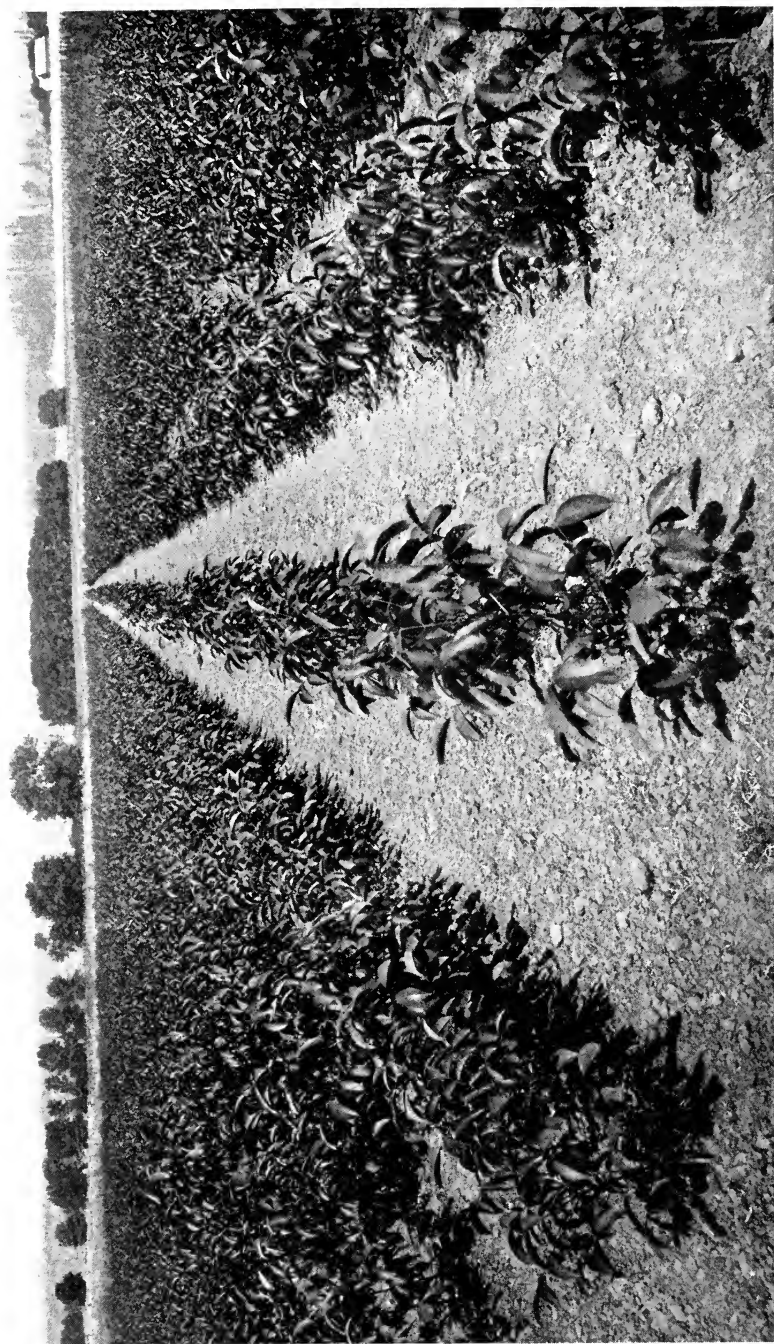
The advantages of the Northern California Black stock are that you get a large percentage of germination of nuts, the trees are vigorous growers, and tend to be fairly uniform. The union with the young scion seems to be satisfactory. The American Black has been tried in certain localities with success. It is not as rapid a grower, and it is harder to germinate the seed. Possibly some of the hybrid trees will be found valuable.

Age of Tree.

In purchasing trees one should try to secure good, strong, straight one-year-old trees. It is very easy to get such trees from six to eight feet in height, which show plenty of vigor.

Setting of Trees—Planting the Orchard.

Before planting the orchard, the ground should be very thoroughly plowed and harrowed and put into good tilth condition. The trees should be set from forty to sixty feet apart. When trees are set at a distance as great as sixty feet, it should be only where the soil is extremely rich, or where one plans to intercrop or use fillers extensively. With many soils, a distance of forty feet is ample, while fifty feet is a distance preferred by many growers. The hole should be dug sufficiently wide to accommodate the roots nicely, and deep enough to allow the filling in of some good top soil and the setting of the tree from two to four inches deeper than it was in the nursery row. When setting, all broken or decayed roots should be cut off with a good sharp knife. Where the tap root has been severed, a good straight cut should be made. Formerly it was argued that walnuts would not grow if the tap root was injured. This has been proved to be a fallacy, as the thousands of acres of



Young Walnut Trees in Nursery Row.

grafted transplanted trees in the Northwest now testify. I would treat the roots of the walnuts very much the same as those of any fruit tree. While planting can be done in the fall in many parts of the western and southern parts of Oregon, probably late winter and early spring would, on the whole, be the most desirable. Some men have advocated that, instead of planting trees, nuts be planted in the field where the orchard is to be developed; that three to five nuts be planted in holes where the tree is desired and all but the strongest of these seedlings be discarded. I have never seen a good orchard developed in this way and doubt its practicability. It certainly is more expensive and harder to take care of young seedlings scattered over a forty-acre field, than it would be to have them in compact rows in the nursery, where they could have the best of care.

There are various systems of planting the orchard. Where the filler system is to be used, the setting of the trees by what is known as the quincunx system is perhaps the best. In this system the trees are set in fives, the permanent plantings being in the form of squares or rectangles, and the filler being the tree which is planted in the center of the square. About 75 per cent more trees can be planted by this system than by the square or rectangular. The square or rectangular system is the best where one wishes to intercrop extensively; or where it is the aim of the orchardists to grow truck crops, berries or similar crops, this system will prove the more satisfactory. It does not give as many trees to the acre, neither are the trees equally distant, but it does allow for tillage better than any other system.

The last system is known as the hexagonal. In this system the trees are set, as you might say, in circles of six, with a tree in the center of each circle. The trees are all equally distant, as they are planted the radius of the circle apart. This system does not allow for tillage or intercropping as well as the two first systems.

There are three systems of pruning the young trees. In the first system, I wish to describe, the trees are cut back when they are planted to two or three buds. These buds are allowed to



Tree headed too high.

force out shoots in the spring and after they have made a sufficient growth to determine which one of the three is the best, the other two are removed. The one remaining shoot is then tied securely to a stake, so that it will not be broken or injured in any way. In the second spring this tree is re-headed to a height of about forty-eight inches and the heading formed so as to have the main branches spaced as widely apart as possible. This system is a fairly easy one for the average man to handle.

The second method is to head the trees much the same as our apple trees; say, twenty-five to thirty inches in height and the main head is formed the first summer. With this system, however, extremely good staking and tying must be followed, or the head will not be satisfactory. This system is a superior one for the expert horticulturist.

The third system is to train the trees to whip for three or four years, allowing no laterals to grow until that time. This was formerly the most popular system in the Northwest, but is gradually going out as it makes the trees too high-headed, and makes it very difficult to stake and tie the main scaffold branches satisfactorily.



English Walnut headed too high



Well kept orchard with prune trees as fillers.

All walnut trees need thorough staking. A good strong post should be set that will stand at least seven feet out of the ground. During the first two or three years of the tree's life, it will be necessary to do considerable tying in order to prevent



American Black Walnut Tree topped with English. Poor practice to use so old a tree.

drooping over too much. Tying with broad strips of cloth, bed ticking, or similar material, is preferable and each individual main scaffold branch should be tied to the stake. Care should be taken not to tie the branches so close to the stake as to cause them to grow too upright.

The tillage of young walnut orchards is very much the same as that practiced in our young apple and pear orchards. Much plowing and harrowing should be practiced in early spring and the ground placed in such condition that it can catch and hold



Trees planted too close together, crowding tops

the spring rains. At frequent intervals the ground should be harrowed, so that no weeds are allowed to grow and the ground prevented from packing and cracking. These frequent shallow harrowings should follow at short intervals until such time as the young trees have made satisfactory growth, which should normally be from the middle of July to the middle of August. In our older orchards, it will probably be necessary to continue tillage later in the fall, because if we do not hold the moisture, the tree's vitality may be affected, or there may be a tendency for the nuts not to fill well. Where trees do not start well the first year or two, it may pay to give each tree a couple of buckets of water some time during early summer. The trees should be hoed soon after such watering.

Where irrigation is practiced, it should be followed as is generally done with the fruit trees. One should take care not to have the water come in contact with the bodies of the young trees. Pools of water should not be allowed to stand close around the trees for any length of time. In irrigating, care should be taken to get plenty of water down in the sub-soils to encourage deep rooting of the trees. Irrigation should not, however, take the place of tillage. The two must go hand in hand if the best results are to be secured. Where one is depen-

dent to a large extent upon artificial water, the sub-soil should be examined and never allowed to get so dry that when a portion of the sub-soil is pressed tightly in the hand, and the fingers removed, the soil naturally falls apart. After each irrigation, a great deal of tillage should follow.

As yet most of our orchards in the Northwest are so young that artificial fertilization has never been resorted to to any great extent. Where trees are lacking in vigor, or where the land planted to orchard has been in grain for many years, it will often be found advisable to add stable compost where it can be obtained cheap and in large quantities. One cannot afford to pay much for such fertilizer, however, nor will it pay to haul it far. I doubt if it will pay the average grower to try the commercial fertilizers. Experiment stations, from time to time, are trying out such plant foods. It is only by careful experiments that one can demonstrate the real value of any element. Cover crops often can be sources of material aid to the orchard. These should be planted the latter part of August or very early in September. Under average conditions, the seed should be drilled in at the rate of about forty pounds of forage, or Oregon vetch, to about ten to twelve pounds of oats or rye. It is essential that the seed be drilled in and be planted early.

Inter-Cropping and Use of Fillers.

Since the walnut trees are planted so far apart—forty or fifty feet—there is a considerable waste of ground the first ten years of the orchard's life. The question which confronts every walnut grower is how he can best utilize this area between the trees, so as to bring in some cash return. As far as soil and care of the trees is concerned, the best type of crops to grow is truck garden crops, such as beans, peas, squash, melons; small fruits, such as strawberries, currants, and gooseberries; and it would even be possible to use some cane fruits, such as raspberries, and some men have tried such crops as loganberries. Strips of hay, especially vetch hay, consisting of a mixture of vetch and oats, can be used to advantage by many growers, since in this way sufficient forage can be raised for the horses that are



Well headed tree. Properly pruned would become ideal.

necessary to carry on the orchard work; but where strips of hay or grain are grown between the trees, it is advisable to leave clean tilled strips on either side; otherwise, the trees will become stunted.

It will be well for some of the walnut growers in western and southern Oregon to consider the possibility of handling hogs in connection with the orchards. Such crops as cow-horn turnips, Aberdeen turnips, rape and vetch, can be planted by the middle of July and should make a most excellent winter feed. It would not be advisable to keep a

large number of hogs on heavy, poorly drained soils. On the average rolling soils, this system is practiced and is being used by a number of growers.

The excess stock of hogs is generally turned off in early spring and this is a time when prices are generally quite satisfactory. If the orchardist has some spare land that he can raise grain on, so as to obtain large quantities of wheat screenings, it may be found possible to produce cheap pork. It is not advisable, under ordinary conditions, to grow large quantities of grain among young trees. It is only orchards that are



Tree with weak crotches, account branches all coming out at one point.



Walnut Tree with a good spread.

growing too vigorously that can stand such treatment safely.

Some men prefer using fillers to inter-cropping. The ideal filler for the young walnut is the Italian prune, a small, compact tree which will enable the orchardist to get a number of paying crops before it becomes necessary to take out the trees. After the walnut begins to get large, however, it will crowd the prunes, and it will only be a question of time before the vitality of the prune trees becomes so low that it will be advisable to take them out.

Walnut culture lends itself to general farming. As the trees require very little spraying and not much unusual attention, the average farmer should be able to meet with a fair degree of success with this crop. Walnut culture also combines itself very nicely with certain crop combinations. For example, berries, prunes and walnuts would make a most excellent combination. The berries—such as black caps, or loganberries, could be evaporated. Later the prunes could be handled in the same evaporator. Finally, the nuts could be dried in the same

building. Thus one would be securing better returns for the investment in the evaporator. A certain amount of general farming and handling of chickens and hogs would lend itself nicely to this above named combination. With the family cow and a good garden, such a combination should very largely meet the requirements of the family table and, at the same time, bring in a splendid cash income.

Where irrigation is possible, it would be advisable to attempt to grow such crops as clover after the orchard has come into bearing, watering it sufficiently to produce both clover and walnuts abundantly. The clover could either be turned into hay or could be pastured over by live stock, such as sheep, for example.

The walnut should be more adopted as a home tree. It makes a most excellent shade tree for the yard, and can be developed into a satisfactory street tree; but where this is attempted, I would advise the growth of first, the American Black, or California Black, and later the top-working of such trees to selected English strains. Thousands of trees in the state have been so top-worked and are becoming very valuable.



Walnuts on the trees.

Where walnuts are used as home or street trees, care should be taken not to crowd them very much with such trees as maples, oaks, etc., as invariably the walnut does not seem to thrive as well under such conditions as when it has plenty of room.

Pruning.

We have already treated the subject of pruning at the time of setting the trees. After the trees have made their first year's growth, one should choose the branches which are to form the framework of the trees. Four or five branches should be



Prince Dryers, Dundee, Oregon.

chosen and it is advisable to have these spaced as far apart as practicable, and I would suggest heading them back in about the same way as one would head back the apple, pear, and prune trees, cutting the strongest branches back the most and the weakest ones the least. In this way we will constantly encourage the weaker branches and bring the trees to a better balance.

In forming the scaffold branches of your tree, try to choose branches that will not form a poor angle with the trunk. Such branches are very apt to split off by the end of the second year.

It will be advisable to give the trees annual pruning. The general tendency of many of the English walnuts is to grow decidedly one-sided, one or two branches growing much more vigorously than the rest. These very strong branches should be decidedly checked—cut back hard, so as to force out the weaker and smaller branches. By this persistent heading back the first two or three years, you will force out abundant laterals which will give you plenty of wood to choose from in building up a strong tree, one having plenty of bearing surface. If the trees are allowed to go unchecked, they will not only become one-sided, but you will have long naked branches with very few bearing laterals. The amount of wood that can be cut from any tree must vary according to the growth it has secured.



A typical orchard scene in the Willamette Valley.

Some branches will be shortened to eight or twelve inches, while with others it will be advisable to let them grow from twelve to twenty inches, according to the balance of the tree. It will be necessary each year to thin out a few of the undesirable branches that form bad angles, or have a tendency to grow inward.

After the trees come to bearing, about the only pruning necessary will be to thin out the trees where they tend to become too dense, and occasionally suppress some few of the leaders that tend to become too rangy. It will also be found advisable during the first few years to shorten back or remove some of the branches that droop to the extent of interfering with tillage. The great tendency of the walnut is to droop, and no matter how well the trees are trained, one will always have to remove a certain number of drooping branches.

Pruning should be done preferably after the danger of serious freezing is over and before the sap starts to flowing strongly in the spring. For western Oregon, February is generally a very suitable month for walnut pruning.

Diseases.

There are a number of diseases that attack the English walnut. The most serious of these is the walnut blight, known scientifically as Bacteriosis. This is a bacterial disease and is probably carried by insects. Its first appearance is noted in early spring. On the leaves it starts in the form of black spots which enlarge and generally cause some malformation of the leaves, those attacked often bending towards the area affected. Black patches will appear on the outer bark, often causing a drying up of the young twigs and fruit spurs, killing them back to the main branches. The damage to the tree, however, at least in Oregon, is, as a rule, not serious; especially is this true of the better French strains. The greater damage comes from the attack on the nuts. Small, black, irregular spots which spread quite rapidly appear on the surface of the nut. When these appear soon after the young nuts are formed, they will generally cause a large dropping of the fruit. Those nuts which do not drop often have their meats ruined by black decay.



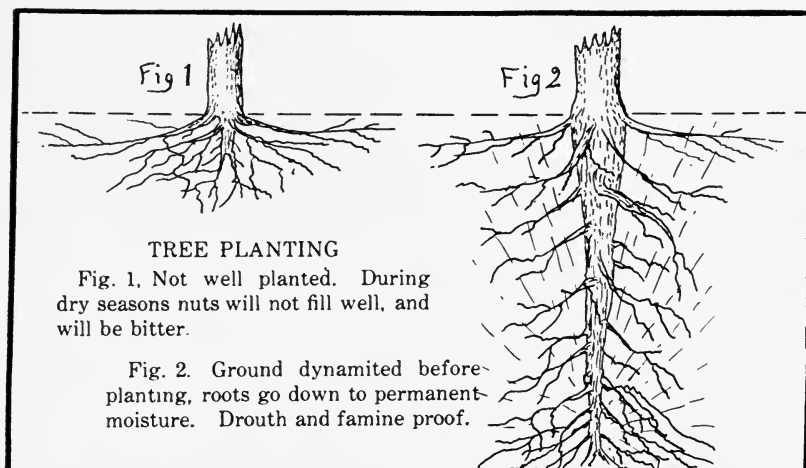
Young walnut orchard with strawberries between rows

Where the attack appears later in the season it will cause portions of the hull to dry, blacken and shrivel, and may cause some premature dropping of the nuts near the harvesting period, and even though it may not destroy the meats, it often makes the nuts unsalable, as it tends to discolor the shells. The disease varies according to climatic conditions, being much worse some seasons than others. The early blooming varieties are generally more attacked than the later blooming ones. This is especially true under California conditions.

There is no known remedy other than cutting out and destroying the affected parts. A recent survey which the author made revealed the fact that it seemed to be a general rule this past year that the young walnut trees which were rather low in vitality were the ones most seriously affected by this disease.

While the disease certain years has been quite bad on some trees, nevertheless it is not of such a nature as to keep one from entering the walnut industry. The best line of resistance to the disease is in choosing fairly resistant strains, and giving the trees good care.

The mushroom root rot, which attacks such fruits as apples and pears, also attacks English walnuts. While it does not seem to attack the American Black and California Black roots



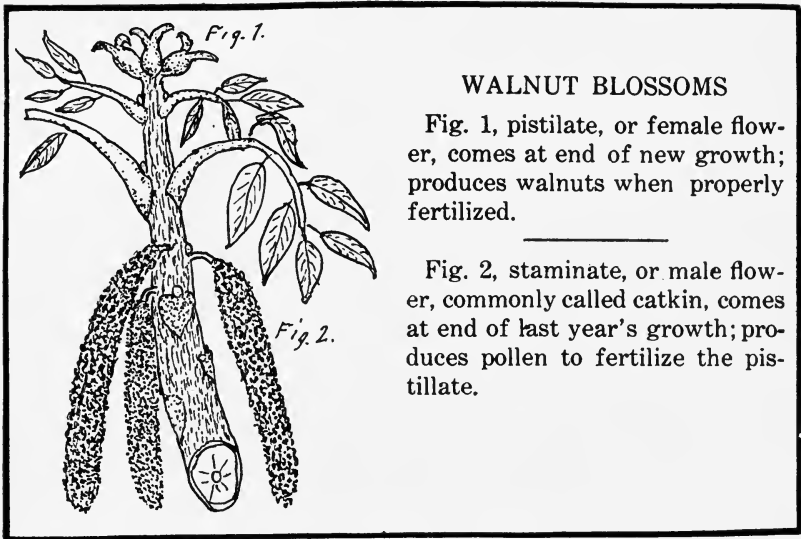
seriously, it is very serious on English roots, and even where trees are grafted, if the union comes below the ground, it may kill the tree at the point of union. On this account, on recently cleared lands, it might be better to plant the trees with the union exposed. The best known remedy is to scrape the dirt away from the affected parts, clean off decayed portions, and leave such portions exposed to the dry air for at least one season.

Crown gall has been reported in a few instances, but has not been found to such an extent as to be thought serious.

Shriveled meats is a problem which may have to be met. This seems to be much more serious in California than in Oregon. The shriveling, or drying up of the meats in the shell, may result from a number of causes, such as poor pollination, too dry soil, aphid attacks, or because the tree is so extremely late that it does not have time to develop its fruit.

Insects.

About the only insects needing serious attention that so far have appeared to attack our young walnuts are the San Jose scale and the Aphis. Both of these pests are very easily controlled and the same remedies that are used for our fruit trees suffice to control these pests.



WALNUT BLOSSOMS

Fig. 1, pistillate, or female flower, comes at end of new growth; produces walnuts when properly fertilized.

Fig. 2, staminate, or male flower, commonly called catkin, comes at end of last year's growth; produces pollen to fertilize the pistillate.

Pollination.

Pollination is a problem that may need some attention. The older grafted orchards of California where only one variety is grown seem to bear quite satisfactorily. Young trees, however, do not set their fruit well. Often a tree from four to six years of age will start from one hundred to three hundred nuts, only to have a large number of them drop to the ground prematurely. This is due to the fact that the young walnut trees do not produce sufficient catkins and, therefore, do not have a sufficient quantity of pollen. After the trees become older, there seems to be less trouble from this source. With the young Franquette trees it is especially noticeable that the catkins are scarce the first few years, but by the time the trees reach the period of heavy bearing, at seven years, there are generally sufficient catkins to insure a good crop. With the Mayette, the female blossoms sometimes appear before the male, while with the Gladys, they are both apt to appear together. Our experience with fruit has shown that it is better to have several varieties in an orchard; that a larger crop can generally be secured by cross pollination. It would, therefore, seem wise for the walnut grower to plant a few trees for pollination purposes, even though the greater part of his orchard consists of a single variety.

Harvesting and Marketing.

As soon as the nuts are ripe in the fall, the hulls generally split and the nuts begin to drop. It will be necessary to make three or four gatherings of the nuts at intervals of from three to five days apart. The work can be so handled that it takes about five days to make one picking, and then the crew can start over the orchard the second time. During the first picking, it is unwise to shake the trees vigorously, as such shaking is very apt to cause immature nuts to fall. Many nuts still have their husks tightly sealed and they will drop if the tree is shaken vigorously. Bamboo poles with hooks can be used to jar the branches. Care must be taken, however, not to bruise or injure the branches with the hooks.

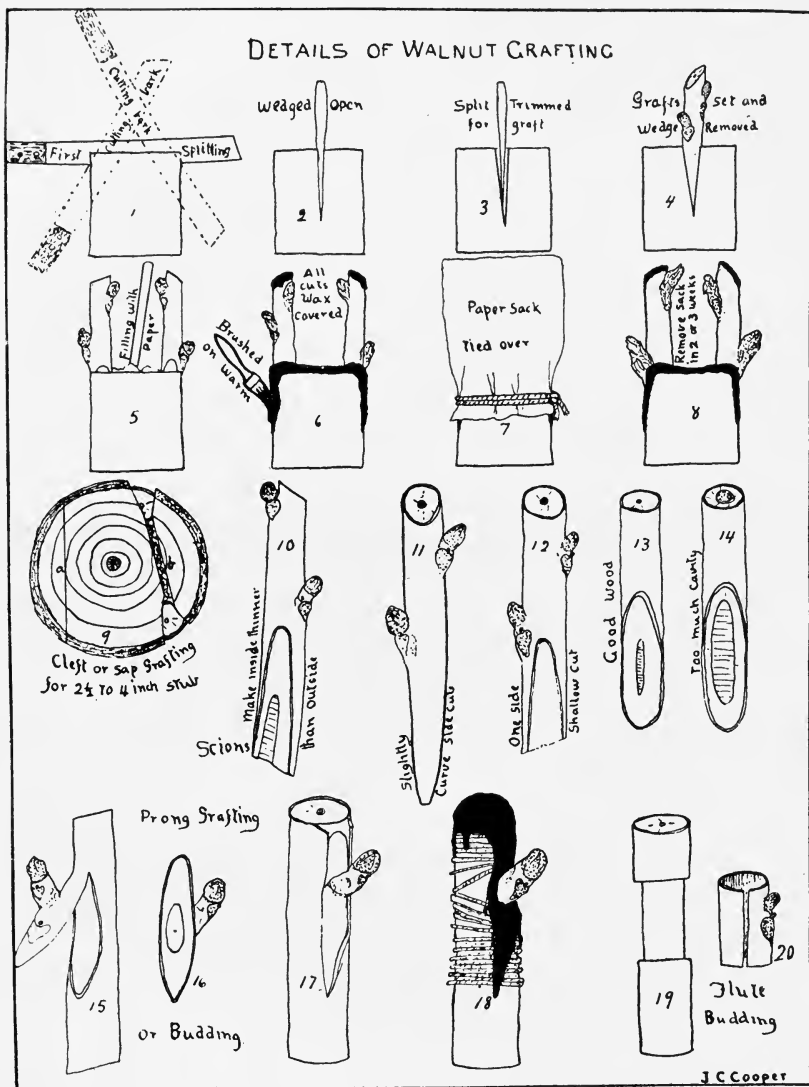
At the second picking, it will be well to shake the trees somewhat, but no attempt should be made to remove all the nuts at this time.

At the third picking, nearly all the remaining nuts should be properly matured. However, in the seedling orchards there is a wide period of maturity. In fact, a few trees never mature their nuts properly.

Some of the growers have each picker carry two pails. In one they place the culled nuts, and those to which the hull strongly adheres. In the second, the well matured nuts, those free from hulls. The two grades are kept separate in sacks as they are brought to the washer.

Some growers have found that often those nuts which have not shed their hulls will do so in a few days and make a practice of throwing them up near the trunk of the tree, gathering them the second time. However, there will always be some nuts that will never shed their hulls and are practically worthless for commerce. It does not pay to try to pull the hulls off by hand, as small portions are apt to stick to the nuts, and even though the hull is removed, the nuts are apt to remain discolored. Such nuts are also often poorly filled.

The nuts should not be allowed to remain in the sacks very long because, in their damp condition, mold will start very rapidly.



Some growers make a practice of picking one day and washing and starting drying the next. In the early morning of the second day the nuts are washed. This is done to remove dirt, mold, fiber, or any foreign material. Some of the small growers have used ordinary churns; others have placed the nuts in large wooden trays, which are dipped in troughs of water—the trays being churned up and down in the water until the nuts

are clean. Some men are using the prune dippers and washers quite satisfactorily. It will be necessary, however, to use a broom to help wash the nuts, and it is well to have a false bottom in the water container. This will allow the fiber to settle below the false bottom. The fiber is often quite plentiful—from one to two boxes sometimes being secured from a ton of nuts. Poor nuts can often be picked out as they are passing through the machine.

It is well to start drying as soon as the nuts are washed and a temperature of at least 70 degrees should be maintained. The best temperature varies from 70 to 90 degrees. Below 70 degrees the mold will develop. Above 90 degrees, there is danger of causing the seams to break—and there is the additional danger of breaking down the oil in the nuts, which will later cause them to become rancid.

It will take two days and nights to dry the nuts thoroughly. If they can be placed in the dryer in the early morning, they can often be dried sufficiently the first day, so that it will be safe to let the fire go out at night. If no night firing is done it will take four or five days to dry the nuts.

The numerous prune dryers can be used for the drying of nuts. However, if one were equipping a building especially for handling walnuts, it would probably pay to introduce some of the improved California machinery for washing and grading, and the drying rooms should be built on the kiln type.

Occasionally nuts can be dried out of doors, but care should be taken not to have them exposed to a temperature greater than 90 degrees, and it will be necessary to cover them at night on account of the excessive dampness in the fall of the year.

As soon as the nuts are dried, they should be placed in a cool, dry place, where they will keep until ready for the market.

As yet very little bleaching of the nuts has been practiced in Oregon. The trade has taken all nuts just as they have been washed and dried and has paid the top price for them. It would be well for us, indeed, to encourage this tendency. While bleaching whitens the shells, it is a question as to whether it can be done without causing the quality of the nuts to deteriorate.



The result of proper care.

Where bleaching is to be done, the following is a solution used in California:

6 pounds Bleaching Powder (Chlorate of Lime)
12 pounds Sal Soda
50 gallons Water.

First, the bleaching powder should be dissolved in a small quantity of water—three or four gallons. Mixture should be stirred until the powder is dissolved. In a separate container, holding a few gallons of water, dissolve the Sal Soda. Mix the two solutions and stir well, and allow it to stand until the Carbonate of Lime settles in the bottom. The clear liquid should be drawn off and diluted with water so as to make fifty gallons. The nuts are placed in dipping boxes, are immersed in the fluid, and then one and one-fourth pounds of 50 per cent Sulphuric Acid is added. The liquid is agitated by raising and lowering the dipper. In from five to ten seconds the nuts should be sufficiently bleached and should then be rinsed in clear water and dried. There are mechanical contrivances for doing this work. The same liquid can be used as long as it gives results. Occasionally it is necessary to bleach the nuts more than once.

As soon as the nuts have been thoroughly dried, they should be graded. Up to the present time, Oregon orchardists have

been able to sell their nuts without grading, but as the crop increases, grading should be established, and probably will be demanded by the purchaser. Generally, at least two sizes are made. First, those nuts which will not pass through a one-inch mesh; and, second, those which will pass through a mesh not larger than one inch and not smaller than three-fourths of an inch.

There are mechanical contrivances for doing this grading. Buyers will often crack one hundred nuts taken at random from various sacks, and if about ninety per cent of these are well selected, are of the proper color, and properly dried, they will generally purchase them as first class nuts.

After the nuts have been graded, they should be stored until marketed, and should be kept in a cool, dry place. For marketing they can be put up in the small cartons, or can be sacked in gunnysacks holding about fifty pounds.

Variety.

The question of the best variety, or varieties, to plant is a very important one, and it is the hardest question for us to attempt to answer in Oregon at this time. This is due to the fact that such a small percentage of our orchards have reached full bearing.

We have not, as yet, secured the ideal nut, perhaps we never will. We need one which should approach the following standard: of good size, tightly sealed, handsome color, and not too rough. The shell should be just thick enough to stand handling. The kernel should fill the shell thoroughly, should be heavy and have a light pellicle. The variety should be a good pollen producer, a vigorous grower, and free from blight. These are just a few characteristics that come to my mind off-hand. There are doubtless others. Possibly it is too much to expect all in one nut. To use the familiar idiom, we should certainly be getting everything in a nut shell.

At the present time, the Franquette seems to be the best nut we have, and the Mayette is very promising. These two are the most desirable varieties at the present time. Undoubtedly, however, we should obtain one or two very favorable strains of



Electric train, Southern Pacific Co.

walnuts from the large number of seedlings that have been planted. While the growers are planting the Franquette more than all others combined, it is wise to plant a few other varieties for pollination purposes. This is regardless of whether the Franquette is self-fertile or not, since our work with tree fruits points conclusively to the fact that we get better returns where we provide for cross pollination. It would, therefore, seem advisable for the grower to plant a few of the better varieties as pollinators, even if not more than one tree to the acre were used.

Franquette.

This is a very old nut. It has been grown commercially for over a hundred years. There are numerous strains, but the so-called Vrooman is probably superior to most other strains. The Franquette is a high quality nut, is a good vigorous tree and a regular bearer. It does not bear heavily while very young, and one should not expect big returns before the seventh year. At the best, the variety is only a medium bearer.

While attacked with blight, it is seemingly as resistant as any of the varieties grown.

Mayette.

The Mayette is a nut of superb quality. It is the Grenoble nut of commerce, is of ideal commercial shape and quality. Its greatest drawback in Oregon seems to be its light yielding qualities in many cases and its questionable vigor. There is, however, a possibility that we have not secured the best strains as yet in this state. There are a few growers who speak very highly of this variety. Mr. Forbes of Forest Grove thinks it a better yielder and more vigorous than the Franquette. The vigorous Sturgis tree is well known.

If one could be sure of getting the proper strains, the Mayette ought to be a profitable nut to plant, but at present we advise conservative plantings.

There are numerous other nuts which might be tried on a limited scale. The Kirk, which originated at Brownsville, is a very heavy yielder, a good grower, and of good quality. Its most serious drawback, however, is that quite a percentage of the nuts are not tightly enough sealed.



Where the walnuts are dried.

The Meylan is a nut of much promise—one of the handsomest nuts we produce and of good quality. It has not been grown extensively, but indicates that it is rather a light bearer.

The Glady is a very large nut of good quality, but the market does not favor large nuts with rough shells.

The Eureka, Concord, and Wiltz have been tried on a very small scale. The first two so far have not been very promising, but possibly will show up better when more trees come into bearing.

There are many conflicting reports concerning the Wiltz, but it is in the list which should be tried very sparingly. The soft shell types, such as the Santa Barbara and the Santa Rose, are not suited to the climatic conditions in Oregon. They are a type of nuts which should be confined very largely to Southern California.

The French strains are seemingly the only ones that it is safe for us to plant extensively.

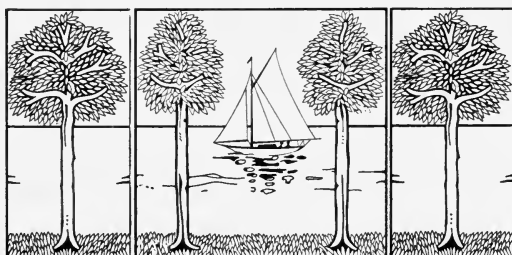
It is too early to be able to state just what the yields and profits from English walnut growing in Oregon will be. We know there is a tree in Northern California that has produced 712 pounds of nuts in a single year, and it is not uncommon to hear of trees producing more than 200 pounds of nuts. These



Ripe English Walnuts
bursting the outer shell.

trees, however, are extremely rare, and while there are many orchards which, in a single year, will produce a ton or more of marketable nuts per acre, it will be safer for the investor to plan on a lower average; say, 1,000 or 1,200 pounds per acre. These nuts will sell for from 13 to 30 cents per pound, according to present prices, the same depending upon the grade of the product.

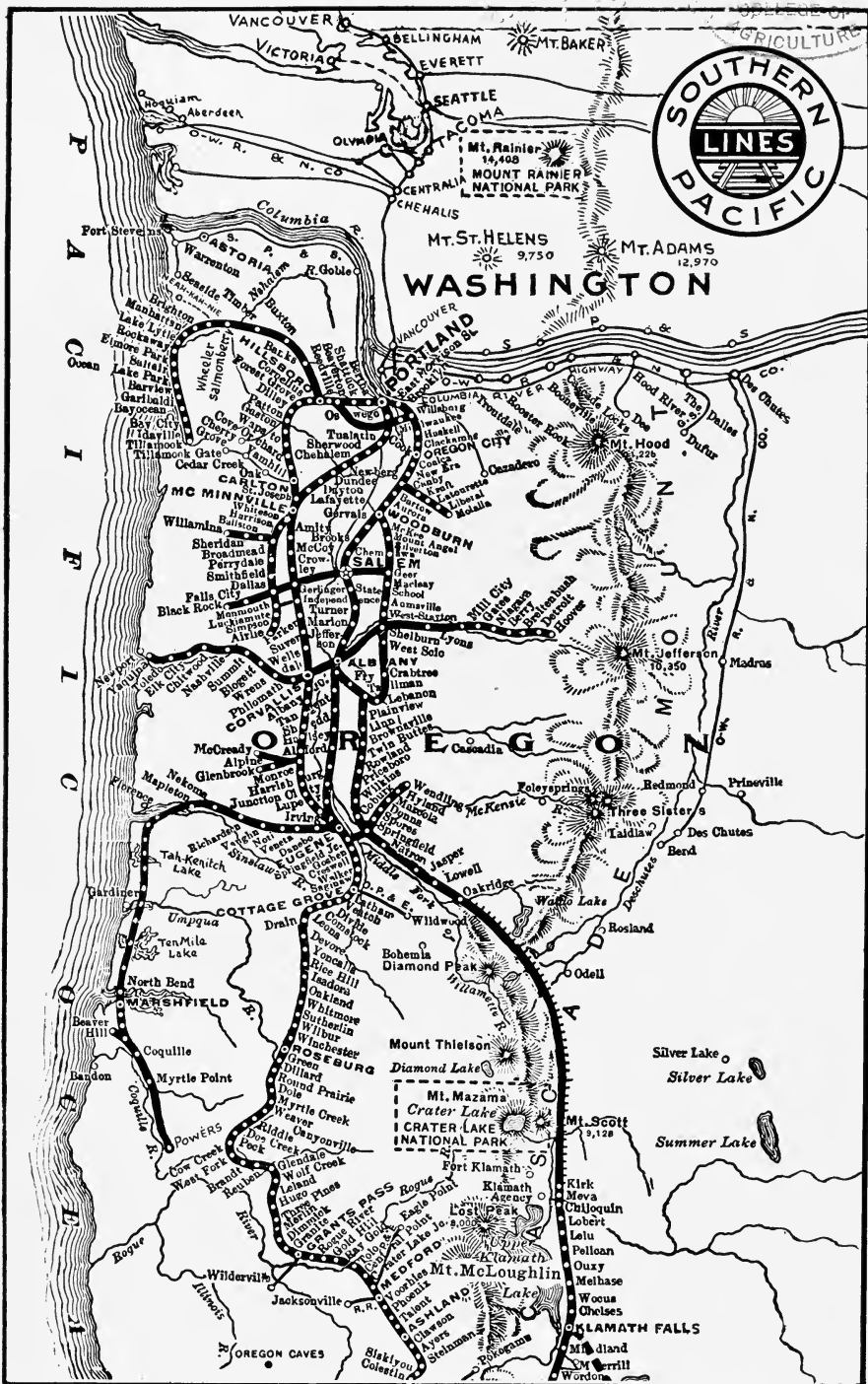
As to how much money can be made from the business, it will depend upon the initial price of land, the acreage developed and the relation of the walnut orchard to other fruits, or general farm crops. The larger the acreage, other things being equal, the cheaper the production. It would seem that with a combination, including reasonable land values, economic units, and good business management, one ought to be able to expect a return of \$100.00 per acre. While, of course, many will surpass this, others will not reach it. However, I would call the investor's attention to the fact that \$100.00 clear profit means 10 per cent interest on a valuation of \$1,000.00 per acre, and there are very few investments in the world that would yield such a figure.

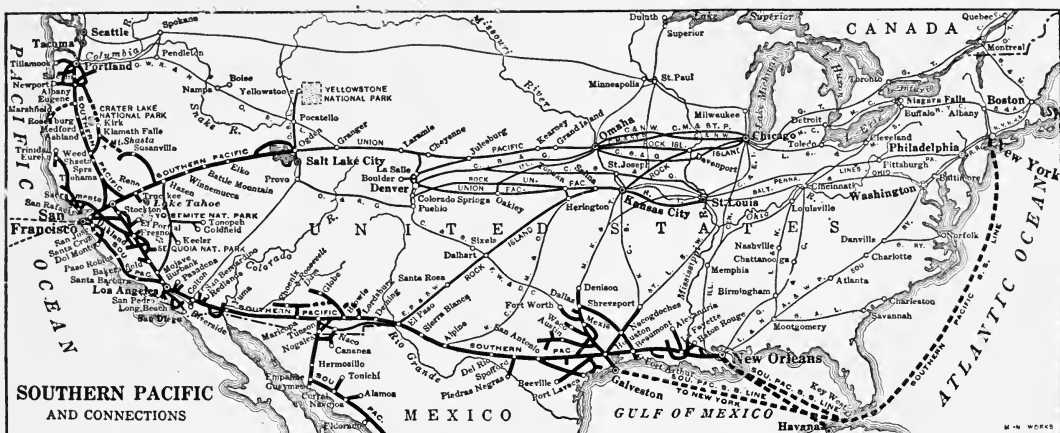


List of Principal Walnut Orchards in Western Oregon

NAME	No. of Acres of Trees	Grafted or Seedlings	Age of Trees Years
Matthews Planting Co., Portland, Ore.....	1610.87	Seedlings.....	
Skyline Orchard Co., Salem, Ore.....	203	Grafted.....	
Thos. Withycombe, Portland, Ore.	200	Seedlings.....	
E. L. Dorn, Monmouth, Ore.....	159	Seedlings.....	5
J. W. Jenkins, Eugene, Ore.....	110	Seedlings.....	
Fred Groner, Hillsboro, Ore.....	100	Grafted.....	1 to 7
Jesse A. Foster, Independence, Ore....	100	Seedlings.....	6
Dundee Fruit & Walnut Co., Dundee, Ore.....	72	Seedlings.....	
C. M. La Follett, Amity, Ore.....	65	Grafted.....	1 to 7
J. W. Quackenbush, Eugene, Ore.....	56	Grafted.....	2
Charles Trunk, Dundee, Ore.....	50	Seedlings & Grafted.....	
Charles McNary, Salem, Ore.....	49	Seedlings & Grafted.....	4, 5, 6
F. C. Malpas, Portland, Ore.....	48½	Seedlings & Grafted.....	
R. Wenger, Newberg, Ore.....	40	Grafted.....	3-5
F. H. Walgamot, Portland, Ore.....	35	Grafted & Seedlings.....	7
M. C. Jenks, Tangent, Ore.....	31	Grafted & Seedlings.....	2 & 3
James E. Jenks, Tangent, Ore.....	30	Budded	4
Thos. Schoolcraft, Dilley, Ore.....	30	Grafted & Seedlings.....	7
Geo. H. Brown, New Era, Ore.....	30	Grafted & Seedlings.....	8
Thos. Prince, Dundee, Ore.....	27	Grafted & Seedlings.....	
H. L. Amoth, Newberg, Ore.....	25	Grafted.....	4 & 5
F. Brutmayer, Grants Pass, Ore.....	25	Grafted.....	3

NAME	No. of Acres of Trees	Grafted or Seedlings	Age of Trees Years
Willamette Orchard Co., Corvallis, Ore.....	22½	Grafted.....	6
P. O. Powell, Monmouth, Ore.....	22	Seedlings.....	6
E. S. Greer, Dundee, Ore.	22	Seedlings.....	
Geo. A. Dorris, Springfield, Ore.	20	Seedlings.....	
S. Ames, Silverton, Ore.....	20	Grafted.....	1
L. L. Paget, Gaston, Ore.....	18	Grafted.....	
Helen V. Crawford, Lebanon, Ore.....	16	Grafted.....	
John C. Bortle, Portland, Ore.	15	2d Generation Seedlings..	
Leland Svarvernd, Jefferson, Ore.....	15	Seedlings.....	21
S. Lindley, Lebanon, Ore.....	15	Grafted.....	
Dugald Campbell, Eugene, Ore.....	14	Grafted.....	4
H. A. Kruse, Sherwood, Ore.	14	Grafted & Seedlings.....	
Alice C. Boochers, Lebanon, Ore.....	13	7
Dick Kiger, Corvallis, Ore.....	13	Grafted.....	4
E. E. Foss, Talent, Ore.....	13	Grafted.....	3 to 6
F. Tomek, Grants Pass, Ore.....	13	Grafted.....	
Wm. Light, Dallas, Ore.....	12	11
W. K. Cardwell, Roseburg, Ore.....	12	Grafted.....	4
F. B. Harlow, Eugene, Ore.....	10½	Seedlings.....	16
Ira C. Powell, Monmouth, Ore.	10	Grafted & Seedlings.....	9
D. C. Hafley, Grants Pass, Ore.....	10	Grafted.....	3
J. P. Young, Sherwood, Ore.	10	Seedlings.....	6-10
Will Young, Sherwood, Ore.	10	Seedlings.....	6-8





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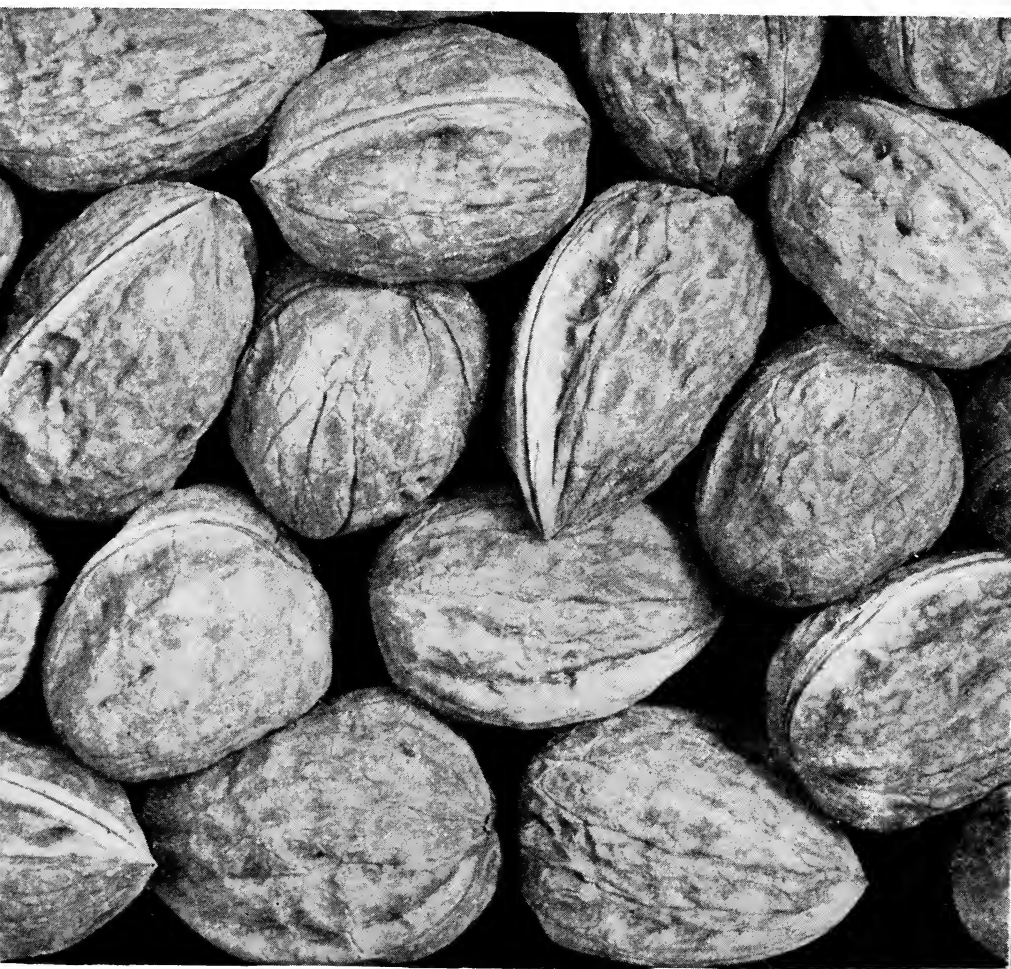
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 Birmingham, Ala., 309-314 Brown-Marx Bldg. C. M. Evans, Gen. Agt.
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 Detroit, Mich., 221 Majestic Bldg. Edward A. Macon, G. A.
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 Houston, Tex. J. H. R. Parsons, G. P. A. Sunset Central
 Kansas City, Mo., 101 Bryant Bldg. C. T. Collett, G. A.
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SOUTHERN PACIFIC

OREGON WALNUTS



SOUTHERN PACIFIC

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